REFRIGERATED DRYER USER MANUAL

APET Series | High Pressure | 45 - 1,000 scfm

225, 500, and 725 psig

WARRANTY NOTICE

Failure to follow the instructions and procedures in this manual, or misuse of this equipment, will void its warranty.

WARNING!

Users are required to read the entire User Manual before handling or using the product. Keep the User Manual in a safe place for future reference.

The information in this manual is current as of its publication date and applies to VF, DHT, and AES Series refrigerated air dryers until next revision of this manual.
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DRYER DATA SHEET

Model Number: _____ Serial Number: _____

Date of Manufacture: _____

Ship Date: _____ Installation Date: _____

Customer Address: _____

Customer City: _____ State/Zip: _____

Other: _____

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SECTION 1: SAFETY

1.1 Introduction

To ensure maximum performance and safe operation of an Aircel refrigerated dryer covered by this manual, everyone involved with the dryer's installation, operation, and maintenance must read and carefully follow the instructions in this manual.

1.2 Safety Signal Words

Throughout this manual, signal words are present to advise of safety precautions and/or standard practices. Obey these signal words as defined below:

DANGER! - Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING! - Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION! - Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE - used to address practices not related to personal injury.

1.3 General Safety Procedures

CAUTION!

Misuse / modification hazard

Misuse or modification of this equipment may result in personal injury.

Do not misuse or modify this equipment under any conditions.

- Improper installation, operation, or maintenance may contribute to conditions in the work area or facility that could result in personal injury and product or property damage. Check that all equipment is properly selected and sized for the intended use.
- Consult and comply with national and local codes relating to fire or explosion and all other appropriate codes when determining the location and operation of this equipment.
- Safe and efficient operation of the unit depends on proper installation.
- Authorities with jurisdiction should be consulted before installing to verify local codes and installation procedures. In the absence of such codes, install unit according to the National Electric Code, NFPA No. 70-latest edition.
- A qualified installation and service agent must complete installation and service of this equipment.
- **DO NOT** weld on / to pressure vessel or modify it in any way.
- **DO NOT** remove, modify, or adjust protective or safety devices.
- Lock out power supply and depressurize system before performing maintenance or service work.
- **DO NOT** operate the equipment with the control panel door open.

NOTICE

For optimum performance, use only Aircel replacement parts.

1.4 Refrigerant Safety Precautions

1.4.1 INHALATION, SKIN, & EYE IRRITANT:

- Use proper safety and protective equipment, including chemical safety goggles or face shield and impervious gloves when handling refrigerants.
- Exercise care to ensure that liquid refrigerant does not come in contact with your skin or eyes.
- DO NOT SMOKE.
- Ventilation in work area must be adequate to keep the concentration of refrigerant below 1,000 ppm.

- System must be free of all refrigerant before any welding or brazing can be performed and must be done in a well ventilated area.
- Decomposition of refrigerants is hazardous! This material can be decomposed by high temperatures caused by an open flame. Hydrofluoric acid and possibly carbonyl fluoride can form in a liquid or gaseous state. Avoid exposure to these toxic fumes and irritating materials.
- Leave the work area immediately if you experience any of the following: smell something unusual, feel light-headed, experience shortness of breath, feel a tingling sensation in your fingers or toes, suddenly feel warm or a rapid heartbeat.

1.4.2 REFRIGERANT FIRST AID RECOMMENDATIONS

1.4.2.1 INHALATION

If high concentrations are inhaled, immediately remove individual from affected area to an area with a fresh air supply. Keep individual calm. If not breathing, give artificial respiration or if having difficulty breathing, give oxygen and call for emergency services.

1.4.2.2 SKIN CONTACT

In case of contact with the skin, immediately flush skin with clean water for at least 15 minutes. Treat for frostbite if necessary by gently warming affected areas and call for emergency services. Remove any contaminated clothing or shoes.

1.4.2.3 EYE CONTACT

In case of contact with the eyes, immediately flush eye(s) with clean water for at least 15 minutes and call for emergency services.

1.5 Implementation of lockout/tagout

The energy control procedure defines actions necessary to lockout a power source of any machine to be repaired, serviced, or set-up, where unexpected motion, or an electrical or other energy source, would cause personal injury or equipment damage. The power source on any machine shall be locked out by each employee doing the work except when motion is necessary during setup, adjustment, or troubleshooting.

1.5.1 PROCEDURES

The established procedures for the application of energy control shall cover the following elements and actions and shall be initiated only be Authorized Persons and done in the following sequence:

1. Review the equipment or machine to be locked and tagged out.
2. Alert operator and supervisor of which machine is to be worked on, and that power and utilities will be turned off.
3. Check to make certain no one is operating the machine before turning power off.
4. Turn off the equipment using normal shut-down procedure.
5. Disconnect the energy sources:
   a. Air and hydraulic lines should be bled, drained, and cleaned out. There should be no pressure in these lines or in the reservoir tanks. Lockout or tag lines or valves.
   b. Any mechanism under tension or pressure, such as springs, should be released and locked out or tagged.
   c. Block any load or machine part prior to working under it.
   d. Electrical circuits should be checked with calibrated electrical testing equipment and stored energy and electrical capacitors should be safely discharged.
6. Lockout and/or tag out each energy source using the proper energy isolating devices and tags. Place lockout hasp and padlock or tag at the point of power disconnect where lockout is requried by each person performing work. Each person shall be provided with their own padlock and have possession of the only key. If more than one person is working on a machine, *each* person shall affix personal lock and tag using a multi-lock device.
7. Taglock devices shall be used only when power sources are not capable of being locked out by use of padlocks and

lockout hasp devices. The name of the person affixing the tag to power source must be on tag along with date tag was placed on power source.

8. Release stored energy and bring the equipment to a “zero mechanical state.”
9. Verify isolation: Before work is started, test equipment to ensure power is disconnected.

1.5.2 GENERAL SECURITY

1. The lock shall be removed by the Authorized Person who put the lock on the energy-isolating device. No one other than the person/persons placing padlocks and lock out hasps on power shall remove padlock and lockout hasps and restore power. However, when the authorized person who applied the lock is unavailable to remove it, her or his Supervisor may remove padlock(s) and lock out hasp(s) and restore power only if it is first:
   a. verified that no person will be exposed to danger..
   b. verified that the Authorized Person who applied the device is not in the facility.
   c. noted that all reasonable efforts to contact the Authorized Person have been made to inform her or him that the lock out or tag out device has been removed.
   d. ensured that the Authorized Person is notified of lock removal before returning to work.
2. Tag out system - Tags are warning devices affixed at points of power disconnect and are not to be removed by anyone other than the person placing tag on power lockout. Tags shall never be by-passed, ignored, or otherwise defeated.

SECTION 2: DESCRIPTION

2.1 Introduction

Refrigerated air dryers are designed to remove moisture from compressed air by use of mechanical refrigeration and are used to protect industrial compressed air systems, machinery, and tools. They are designed to deliver the required dew point at specified inlet air temperature, inlet air pressure, inlet flow, and ambient temperature conditions.

2.2 System

The APET Series refrigerated air dryer products cover the flow range and pressures listed on the manual front cover and provide reliable dew point performance in all flow conditions. Through optimization of critical dryer components – heat exchanger, separator, and condensate removal – the system ensures the highest performance at full- and partial load conditions.

Hot saturated air enters the air-to-air heat exchanger of the refrigerated air dryer and is pre-cooled by the outgoing dry air. Pre-cooling saves energy by reducing the heat load on the dryer's compressor. The cool saturated air enters the air-to-refrigerant heat exchanger where air temperature is lowered to the 38 to 42°F range. This dramatic temperature drop condenses water and oil.

The mixture of cold air and condensation then flows into the two-stage separator filter where liquids and contaminants are removed by centrifugal action, directional flow change, and velocity reduction. Once bulk liquids have been removed, the compressed air goes through a stainless steel mist eliminating filter that coalesces oil aerosols and oil vapors within the 50-micron range, and then separates and removes them. At this point, the compressed air is dry and virtually oil-free.

Cold, dry air exits through the pre-cooler heat exchanger and is reheated by incoming hot air. Reheating restores energy and also prevents condensation from forming on the outside of air distribution piping. In the refrigeration unit, the compressor pumps hot, high-pressure gaseous refrigerant to the condenser where it is cooled and liquefied by ambient air. From the condenser, liquid refrigerant first flows through the receiver, then through a filter/dryer, and finally through the expansion valve where pressure and temperature are reduced. This reduction in pressure causes the liquid refrigerant to boil until it reaches the saturation temperature that corresponds to its pressure. As the low-pressure refrigerant passes through the evaporator, heat flows from the compressed air to the refrigerant, causing the boiling to continue until all refrigerant is vaporized. Refrigerant gas is returned to the compressor and the cycle is repeated.

In the VF and DHT Series dryers, a hot gas by-pass valve is used to control temperature in the evaporator. In the AES Series, the Copeland Scroll Digital™ compressor allows the system to eliminate the need for a hot gas by-pass valve. The closed loop digital controller continuously monitors the evaporator temperature and modulates the loading and unloading of the refrigeration compressor based on current load conditions.

2.3 Refrigeration Circuit

Refrigerant is cycled through a closed loop system commonly known as high pressure and low pressure. Refrigerant is compressed by the compressor to a gas with high temperature and high pressure, which then travels to the condenser (air- or water-cooled) to lower the temperature and condense the gas into a liquid. Liquid travels to the evaporator (refrigerant-to-air part of the heat exchanger) and back to the compressor suction side. The process then repeats. A hot gas by-pass valve is used on the non-cycling VF Series dryers as a freeze protector in low load conditions (100 scfm rated models [1/2 Hp] and up).

2.3.1 TYPES OF REFRIGERANT USED

R-134a refrigerant is used throughout the APET dryer range.

R-134a is a pure refrigerant providing consistent performance (zero temperature glide) and easy service (no mixture of different refrigerants).

2.4 Compressed Air Circuit

The compressed air dryer circuit uses a patented air-to-air heat exchanger. These heat exchangers act as a pre-cooler/ reheater. Hot, saturated, compressed air first enters the air-to-air heat exchanger, where it is pre-cooled by outgoing air from the air-to-refrigerant heat exchanger. This energy saving heat exchanger provides several advantages, such as a reduction of the heat load imposed on the refrigerant compressor and condenser, providing more energy to the outlet air, and preventing condensation of moisture on the outside of the plant distribution air line piping. From the air-to-air heat exchanger, air will enter into the evaporator further reducing its temperature to a desired pressure dew point. As the air is cooled, moisture is condensed, separated, and discharged through the condensate drain. The cooled air then reenters the air-to-air heat exchanger, in a direction opposite to the flow of the warm, saturated incoming air. This counter flow action assures high temperature differential throughout the heat exchanger, resulting in a more effective heat transfer.

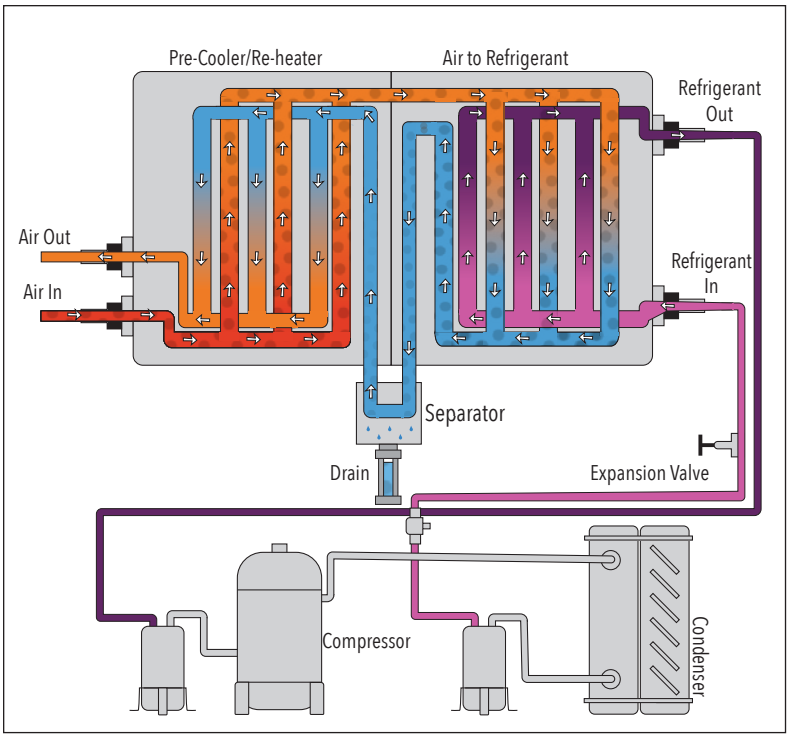


FIGURE 2-1: **TYPICAL SCHEMATIC FLOW DIAGRAM**
APET Series 45 - 1,000 scfm rated models

SECTION 3: INSTALLATION

3.1 Inspection on Arrival

All non-cycling refrigerated air dryers are tested and operated before shipment. However, shipping stresses have the potential to cause damage to the unit. To ensure smooth installation, it is recommended that immediately upon receipt of the unit, the system is checked for the following:

1. Report any damage to the delivery carrier.
2. Request a written inspection report from the Claims Inspector to substantiate the claim.
3. File claims with the delivery carrier.
4. Compare unit received with description of product ordered. Check the serial plate label and make sure that it is the correct Model was ordered. Note the equipment Capacity and Power Supply requirements and ensure that they are in accordance with your specifications. The rated conditions of the dryer are indicated on the serial plate label. If there is any discrepancy, contact your representative listed on the manual back cover.
5. Shipping stresses can loosen connections. All pipe and tubing connections should be inspected.
6. Observe pressure of refrigerant suctions gauge to determine if refrigerant has leaked during transit. If the gauge reading does not match that mentioned on the serial plate label, immediately contact Technical Support listed on the manual back cover.
7. Report incomplete shipments to the delivery carrier and your service representative.

3.2 Lifting Information

WARNING!

Lifting Hazard

Failure to lift the unit correctly can result in severe personal injury or property damage.

- Use appropriate lifting equipment and adopt all safety precautions needed for moving and handling the equipment.
- A hand cart, forklift, or crane is recommended for unloading and installation.
- Lift unit by lifting lugs and frame only. Do not lift by piping.

1. Use all lifting points provided. Special care must be used when lifting the dryer to prevent tip-over.
2. Use clevis connectors, not hooks, on lifting slings.
3. Only lift unit under support frame/base by using the fork lift openings provided. Do not lift by piping.
4. Check the approximate weight provided on the specification control drawing to ensure adequate lift truck capacity.
5. Allow only qualified operators to lift the equipment.
6. Refer to applicable OSHA regulations and local codes when using cranes, forklifts, and other lifting equipment.

3.3 Installation Codes and Procedures

WARNING!

Electric Shock Hazard

This machine is connected to high-voltage power, which can cause severe electrical shock and injury.

- Follow proper lock out/tag out procedures before performing service or maintenance work.
- Electrical installation must be performed by a qualified electrician and comply with all applicable national and local codes.

- Safe and efficient operation of the unit depends on proper installation.
- Authorities with jurisdiction should be consulted before installing to verify local codes and installation procedures. In the absence of such codes, install unit according to the National Electric Code and NFPA No. 70-latest edition.
- A qualified installation and service agent versed in all regulatory codes must complete installation of this unit.

3.4 Locating and Installing the Dryer

WARNING!

Inappropriate tools hazard

Using inappropriate tools for installation or maintenance work can lead to personal injury or property damage.

Appropriate tools must be used for all installation and matinenance work.

1. Locate unit on a level foundation. Dryer should be mounted on a suitably structured flat and level floor or base that is free from vibration.
2. Install unit to provide adequate clearance for maintenance services. Dryer and accompanying filters should be installed with at least 2 to 5 feet clearance from the adjoining walls to provide easy access for routine maintenance and adequate air flow across the condensing coil.
3. The frame or cabinet must be securely bolted to the foundation to prevent movement resulting from earth tremors and induced piping vibration.
4. Install unit using the correct pipe size and pressure rating. See drawing package provided with the unit. Connect the inlet of the dryer to the moist gas from the inlet filter. Install the inlet piping and the inlet shutoff valve. Install the outlet piping and the outlet shutoff valve (a union with a valve by-pass can be installed at the inlet and outlet valves to accommodate isolation of the dryer for maintenance). Compressed air piping has to be at least the same size as that of the inlet and outlet connections of the dryer. Larger pipe sizes can be used with appropriately rated reducers.

WARNING!

Pressure and temperature hazards

Operation at elevated pressure or temperature may cause damage to the dryer or serious injury to personnel.

Each dryer is checked at the factory for proper operation at the conditions noted on the serial plate label.

5. Optional system configuration: Install a dryer bypass or isolation valve to allow isolation of the dryer for service and maintenance without interrupting the compressed air flow.
6. Minimum recommended filtration: Install an Aircel inline compressed air particulate pre-filter before the dryer to protect it against dirt and possible clogging of the heat exchanger.
7. Additional recommended filtration: Install an Aircel inline compressed air coalescing after filter after the dryer.
8. Provide adequate power supply. *See Section A: Specifications*. Make all electrical connections to the dryer as shown on the wiring diagram. Special care must be taken in connecting the proper voltage as indicated on the specification sheet and wiring schematic. Three phase units are equipped with a phase monitor, which will prevent unit from operating when wired in reverse. It is mandatory that the dryer be grounded. Use of your plant's frame as a ground may cause problems with the controls. A fused disconnect is not supplied with this equipment; therefore, one must be supplied by customer. All electrical fuses, breakers, etc.

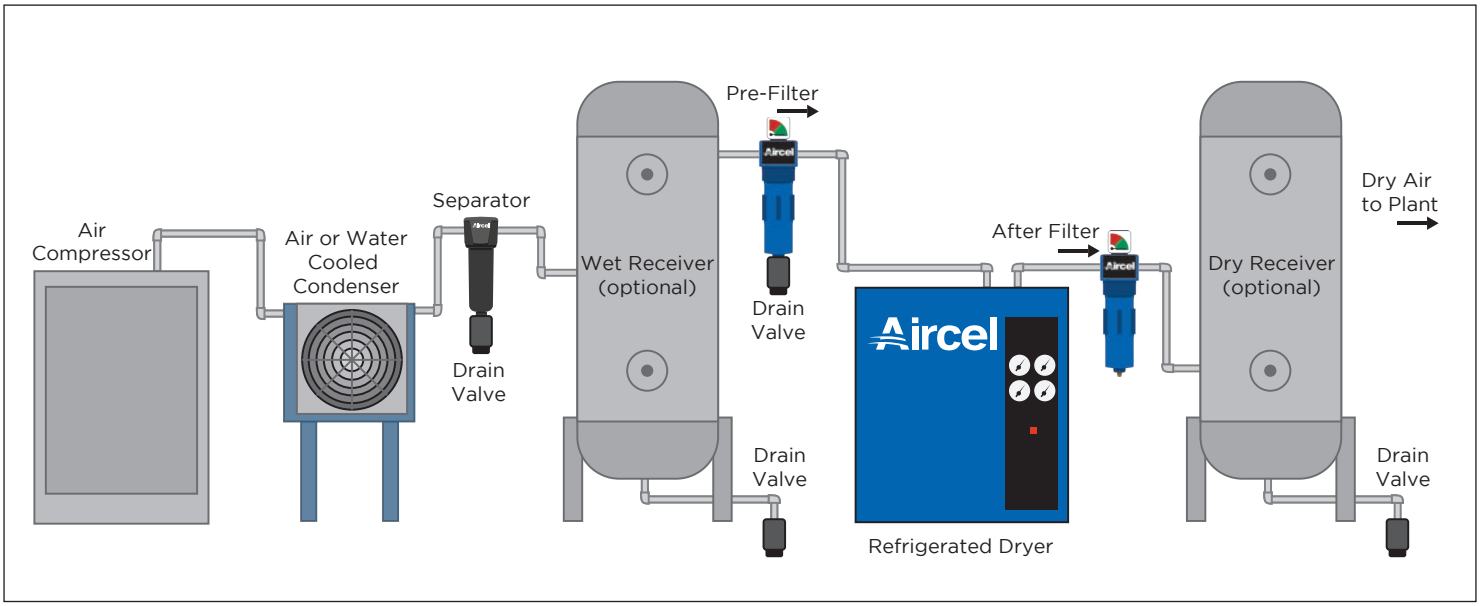


FIGURE 3-1: **Typical Installation Setup**

should be sized by a qualified electrician and comply with all applicable national and local codes. Our company is not liable for any code violations, component damage, downtime or consequential damage related to customer supplied electrical components and connections.

9. The ambient temperature should be between 40 °F and 100 °F. Low temperature could affect the dryer process and result in high outlet dew point. In conditions where the ambient drops below freezing, it is recommended that a heat trace be used for the equipment. This will ensure trouble-free operation during the winter months (the dew point of the outlet air will be consistent).

    - In some cases, a head pressure control valve may be needed. (Optional)

10. Do not place the system in service until the above steps have been completed and that all ratings and specifications have been verified to match the requirements in the drawing package supplied with the unit.

11. If there are any changes in the operating conditions of the system from those published in this manual, contact Technical Support.

3.4.1 AIR-COOLED CONDENSER REQUIREMENTS

Cooling air must be drawn from a clean source to reduce dust and dirt accumulation on the condenser coils. Air temperature should not exceed 100°F (38°C).

TABLE 3-1: **Air-Cooled Cooling Air Flow - APET Series**

Model by SCFM Rating	Refrigeration HP	Cooling Air Flow (cfm)
45	0.20	275
65	0.25	300
80	0.33	300
125	0.50	350
200	0.75	525
260	1.25	750
415	1.50	1,250
570	2	3,000
860	3.50	3,000
1,000	5	5,000

3.4.2 COOLING WATER REQUIREMENTS (WATER-COOLED CONDENSING UNITS)

Cooling water is required for water-cooled refrigerant condensers (scfm rated model 100 and up). The user is responsible for piping the water to and from the condenser. The required water flow rate depends on the water temperature. A water-regulating valve (supplied with the dryer) automatically adjusts the flow to compensate for variation in water temperature, water pressure, and dryer air load. The table below indicates the amount of cooling water required in gallons per minute (gpm) at given incoming temperatures for the condenser Hp size in each model. The refrigerant discharge pressure control will shut down the refrigerant compressor if cooling is inadequate.

NOTICE:

- Water cooled condensers are pre-set at the factory for city water usage.
- Water regulating valve may need to be adjusted to other water supply conditions. Contact technical support for assistance.
- Minimum water pressure is 25 psig for city water and 35 psig for tower water. Cooling water pressures less than these minimums may reduce dryer drying capacity.
- Maximum water pressure is 125 – 150 psig.

TABLE 3-2: Water-Cooled Water Flow Requirements- APET Series

		Incoming Water Flow Rate Requirements (in gpm at different inlet water temperature)			
Model by SCFM Rating	Condenser HP	70°F	80°F	85°F	90°F
65	0.25	1	1.25	1.5	C/F
80	0.33	1.5	1.9	2.25	C/F
125	0.5	2	2.5	3	C/F
200	0.75	3	3.75	4.5	C/F
260	1.25	4	5	6	C/F
415	1.5	7	8.75	10.5	C/F
570	2	10	12.5	15	C/F
860	3.5	12	15	18	C/F
1,000	5	14	17	20	C/F

3.5 Preliminary Start-Up Checklist

NOTICE

- For single-phase models, wait at least **six (6) hours** after transporting or moving of dryer system before starting the dryers. Turn the main power switch to the dryer on, but do not turn the dryer on/off switch to the on position until **six (6) hours** have passed.
- For three-phase models, ensure that the power switch is in the "off" position, but the electrical service to the dryer is energized. This dryer must be in this mode for at least **twelve (12) hours** to allow the compressor crankcase heater to energize and evaporate any liquid refrigerant from the compressor. After **twelve (12) hours**, turn on the power switch of the dryer. The power indicating light should turn on.

1. Check that the inlet and outlet connections are the correct size and pressure rating, and tightened securely.
2. Check that the correct power supply is connected to the non-cycling refrigerated air dryer system with an adequate disconnect switch.
3. Check that all compressed air line service valves are open and that compressed air is available to be supplied to the non-cycling refrigerated air dryer system.
4. Check that all liquid drain service valves are open. This is to ensure that any residual bulk condensate that may have accumulated in the compressed air lines is discharged immediately upon start up. These drains must be closed once system is brought on line for use. The drain valve on the refrigerated air dryer can be opened by pushing the test button located on the drain body.
5. With the customer-supplied compressed air to the system, OPEN the inlet valve slowly to gradually pressurize the system. Do not open valve too quickly. Opening valve and suddenly pressurizing the system can cause damage to the dryer heat exchanger and other components.
6. Check the air system piping connections and dryer system connections for leaks at this time. Repair and retest any leaks.
7. Verify that all instrumentation (pressure gauge/s) and drain air tubing fittings are tight.
8. Ensure that the air system has come up to full pressure and has filled the dryer with compressed air. Before opening the outlet valve on the system and after the dryer has been started under no load, let the dryer run for at least fifteen (15) minutes to allow stabilization of the system. Verify the following:
   a. The dryer is designed to run continually and should not be cycling on and off with the air compressor. The non-cycling operation of the dryer is controlled by an automatic expansion valve or a thermostatic expansion valve / hot gas by-pass valve. The valves will open and close automatically depending on the of heat load to the evaporator, thus maintaining the desired pressure dew point.
   b. Check the inlet compressed air temperature and pressure to the dryer and verify that it meets the specified requirements.
   c. Fan rotation, for dryers with an air-cooled condenser, rotation should be in accordance with the fan rotation shown on the details located on top and back of the condenser. Cooling air is drawn through the condenser coils. Three phase units are equipped with three phase monitors, which will prevent the fan(s) and compressor from running backwards. The unit will not turn on unless the wire leads are in the correct location. The phase monitor, located in the electrical box, will display a green light, when the unit is phased properly. A red light indicates that the unit is not phased properly. If the motor rotation is not correct, turn off the power switch and put the main power supply disconnect in the "off" position; lock and tag; check the wiring; correct the wire lead locations; recheck for correct phasing.
   d. The refrigeration gauge readings should be as follows:
      - Refrigerant suction pressure

        R-134a = 28-40 psig
      - Refrigerant discharge pressure

        R-134a = 160-230 psig

NOTICE

The above discharge pressure depend upon ambient temperature and can vary slightly according to temperature fluctuations.

9. After the preliminary start up checklist has been completed, the compressed air outlet valve on the dryer system can now be slowly opened to supply clean dry compressed air to the facility.
10. After start-up and approximately one month of service, check that all piping and fittings are tight and free of leaks.

NOTICE

- Models with the hot gas by-pass valves and expansion valves are preset at the factory for the desired dew point. Do not adjust without consulting with the factory.*
- The dryers are fully automatic and do not require any auxiliary controls.

** Adjustments not authorized by the factory may void the warranty.*

3.6 Automatic Drain Valve Adjustments

The automatic drain valve supplied is standard on the separator and should open regularly and discharge any accumulated water into the drain line. The period between openings varies with the dryer and operating conditions (electronic type). To minimize air losses, the timer should be adjusted to open the drain solenoid just long enough to discharge the accumulated condensate. The factory sets the automatic drains to open for 7 seconds about every 7 minutes. If more than two seconds of dry air comes out at the end of every discharge cycle, reduce the open time (seconds) or increase the interval of the discharge (minutes) to minimize air loss. If liquid is still being discharged when the discharge cycle stops, increase the open time (seconds) or shorten the interval of discharges (minutes) so it discharges more often.

SECTION 4: OPERATION

4.1 Operating Procedures

After the initial startup, the dryer operation is completely automatic. To understand the details of the operation, see *Figure 2-1: Typical Schematic Flow Chart* on page 4.

4.2 Short-Term Shut Down (Over Night or Weekends)

The refrigerated air dryer system can be shut down at any time by turning the unit off at the dryer by using the on/off switch or at the main disconnect switch.

NOTICE

Before running compressed air flow through the dryer, run the dryer for 15 minutes to stabilize temperature.

4.3 Shut Down Emergency

The non-cycling refrigerated air dryer system can be shut down under any conditions and at any time by turning the unit off at the dryer or at the main disconnect switch. Once power is removed from the dryer system, the dryer must be isolated from the compressed air stream to avoid a refrigeration circuit over pressure situation.

WARNING!

Pressure Hazard

This machine contains contents under high pressure, which can cause severe injury.

- To avoid possible hazard or injury, the operator should be fully familiar with the refrigerated air dryer system and its operation.

- When the system is shutdown and power removed, lock out power supply and depressurize system before performing maintenance or service work to avoid injury to personnel or property damage.

SECTION 5: MAINTENANCE

To reach a field service technician or for technical support, please call the number on the manual back cover.

5.1 Introduction

To reach a field service technician or for technical support, please call the number on the manual back cover.

WARNING!

Electric Shock Hazard

This machine is connected to high voltage power, which can cause severe electrical shock and injury.

- Follow proper lock out/tag out procedures before performing service or maintenance work.
- Prior to performing any maintenance on the dryer, all personnel are strongly advised to familiarize themselves with the equipment by reading the entire contents of this operation manual.
- Follow all safety procedures prior to performing any maintenance activity on the dryer.

WARNING!

Pressure Hazard

This machine contains contents under high pressure, which can cause severe injury.

- To avoid possible hazard or injury, the operator should be fully familiar with the refrigerated dryer system and its operation.
- When the system is shutdown and power removed, lock out power supply and depressurize system before performing maintenance or service work to avoid injury to personnel or property damage.

CAUTION

Inappropriate Tools Hazard

Using inappropriate tools for installation or maintenance work can lead to personal injury or property damage.

Appropriate tools must be used for all installation and maintenance work.

5.2 Maintenance

Refrigerated air dryers require very little maintenance for satisfactory operation. Optimum performance can be expected if the following routine maintenance steps are taken.

5.2.1 DAILY

With the dryer on-line:

- Verify the operating pressure, temperature, and flow rate are correct and conform to those listed in the Design Parameters section. Adjust system if required.
- Always check refrigerant gauges to insure refrigeration system is working properly.
- Check condensate drain separator for proper condensate discharge. If no discharge is evident then depressurize the unit, dismantle and clean separator and/or drain line. Proper drain trap maintenance is the owner's responsibility. It is not covered by warranty.
- Make certain airflow is directed through dryer only. Observe by-pass valves proper positions.

5.2.2 WEEKLY

- Repeat all daily inspections and record data in the maintenance log.

- Clean the condenser coils of accumulated dust and dirt with a soft brush and/or with air pressure from a compressed air nozzle (maximum 100 psig).
- Check the gauge readings for optimum system operation.
- Check oil removal filter (coalescer) indicator (if applicable); if it is red, replace the filter.

5.3 Filter Element Replacement

1. Depressurize the air system to release the compressed air from the air dryer.

NOTICE

Shutting down the air compressor will not depressurize the air dryer unit. Close air line valves before and after dryer and then depressurize unit. Depressurize dryer by pushing the test button on the dryer system drain until there is no more pressure in the dryer system.

2. Remove the filter bowl by turning the bowl 1/4 turn counter clockwise, be sure the O-ring is in place on the top half of the oil filter housing and that the O-ring seats properly. Air leaks may occur if the O-ring is not secured (important).

3. The same procedure applies when removing the filter separator for changing the element (if applicable).

SECTION 6: TROUBLESHOOTING

6.1 Introduction

If there is a problem with the refrigerated air dryer or contamination down stream is present, the problem may be identified from one or more of the following sources:

- Electrical
- Refrigeration
- Condensate removal (drains)
- Other

Do not assume these are the only problems that may occur. All available data concerning a problem should be systematically analyzed before undertaking any repairs or component replacement procedures.

WARNING!

Electric Shock Hazard

This machine is connected to high voltage power, which can cause severe electrical shock and injury.

- Follow proper lock out/tag out procedures before performing service or maintenance work.
- Prior to performing any maintenance on the dryer, all personnel are strongly advised to familiarize themselves with the equipment by reading the entire contents of this operation manual.
- Follow all safety procedures prior to performing any maintenance activity on the dryer.

WARNING!

Pressure Hazard

This machine contains contents under high pressure, which can cause severe injury.

- To avoid possible hazard or injury, the operator should be fully familiar with the refrigerated dryer system and its operation.
- When the system is shutdown and power removed, lock out power supply and depressurize system before performing maintenance or service work to avoid injury to personnel or property damage.

CAUTION

Inappropriate Tools Hazard

Using inappropriate tools for installation or maintenance work can lead to personal injury or property damage.

Appropriate tools must be used for all installation and maintenance work.

6.2 Electrical

WARNING!

Electric Shock Hazard

This machine is connected to high voltage power, which can cause severe electrical shock and injury.

- Follow proper lock out/tag out procedures before performing service or maintenance work.
- Prior to performing any maintenance on the dryer, all personnel are strongly advised to familiarize themselves with the equipment by reading the entire contents of this operation manual.
- Follow all safety procedures prior to performing any maintenance activity on the dryer.

- Make certain that the dryer is connected to proper power supply in accordance with electrical diagram provided.
- Check electrical breaker, fuse, or disconnect to determine if there is electrical power to the unit.
- A quick check should determine if the power switch is turned on and the unit is running.
- After determining that power is supplied to the unit, go to the next step.

6.3 Refrigeration

WARNING!

Electric Shock Hazard

This machine is connected to high voltage power, which can cause severe electrical shock and injury.

Follow proper lock out/tag out procedures before performing service or maintenance work.

WARNING!

Chemical Hazard

Improper handling of refrigerant can cause severe injury.

Refrigerant handling must be performed by a qualified technician and all applicable national and local codes must be followed.

NOTICE

Always observe refrigerant pressure gauge(s) to determine if and how refrigeration circuit is operating.

Non-cycling refrigerated air dryers with R-134a refrigerant should have a suction gauge pressure reading of 28-40 psig and a discharge gauge pressure reading of 160-250 psig with the unit in the on position under full or partial load. If the refrigerant gauge(s) reads more or less than the above specified pressures, troubleshoot items below.

1. High refrigerant readings generally indicate:

- Dirty condenser - Clean immediately!
- Dryer not turned on.
- Overloading - Airflow or conditions in excess of dryer capacity.
- High ambient temperature (≥ 100°F) Provide adequate

ventilation for proper cooling, or reduce ambient temperature.

- Condenser fan(s) not running - Call Technical Support.
- Refrigerant control too high - Contact Technical Support for assistance.

2. Low refrigerant readings generally indicate:

- Low ambient temperature - Temperatures below 40°F. Increase ambient temperatures or install head pressure control valve. Contact Technical Support for more information.
- Refrigerant control setting too low - Contact Technical Support for assistance.
- Loss of refrigerant - Call Technical Support or qualified refrigeration service.

6.4 Condensate Removal

WARNING!

Electric Shock Hazard

This machine is connected to high voltage power, which can cause severe electrical shock and injury.

Follow proper lock out/tag out procedures before performing service or maintenance work.

WARNING!

Pressure Hazard

- This machine contains contents under high pressure, which can cause severe injury. To avoid possible hazard or injury, the operator should be familiar with the refrigerated air dryer system and its operation
- When the system is shutdown and power removed, lock out power supply and depressurize system before performing maintenance or service work to avoid injury to personnel or property damage.

The non-cycling refrigerated air dryer uses a refrigeration circuit to cool the compressed air which causes moisture to condense. The condensed moisture is separated from the dry air and purged through an automatic drain.

1. Condensate downstream of dryer:

- If the unit is equipped with automatic drain override switch, push manual override button to test drain flow.
- Ensure automatic electronic timer (if applicable) is functioning properly.
- Ensure moisture separator (and coalescer) drain lines are free from blockage.
- If the unit is equipped with y-strainer, disassemble and clean.
- If oil is downstream from the dryer:
  - Oil coalescer element is saturated.
  - Dryer not turned on during air usage.

6.5 Other

Sometimes a water or oil problem downstream from the dryer can be identified by an inadvertent action or inaction by the operator.

- Dryer not turned on before air usage.
- By-pass valves in wrong position.
- Air usage exceeding dryer capacity.
- Oil coalescer element dirty.
- Automatic drains not maintained.

6.6 APET Series Troubleshooting Guide

Problem	Probable Cause	Remedy
Water downstream of dryer system or no discharge from separator/filter	Failed or short circuited timer on drain	Replace timer drain
	Failed drain solenoid	Replace timer drain
	Bulk liquid entering the dryer from upstream	Check drains on aftercooler or air compressor
	Inlet compressed air temperature to dryer exceeds dryer capacity air	Check inlet air temperature and adjust as required to meet specifications
	Inlet compressed air CFM flow rate exceeds dryer capacity	Check inlet air cfm and adjust as required to meet specifications
	Leak in the air-to-air heat exchanger	Replace heat exchanger
Water downstream and dryer system not working properly	Refrigeration compressor stopped due to plugged or dirty condenser coil (high pressure)	Clean condensing coil and ensure adequate ventilation of unit
	Refrigeration compressor cycles on/off and cannot maintain suction pressure	Check condensing coil for dirt or debris that could prohibit adequate ventilation of the refrigeration circuit. If it is clean, check refrigerant pressure gauge(s) to determine if the unit is low on refrigerant.
	Low refrigerant	Check for leak in refrigeration circuit; repair and recharge according to specifications
	Low refrigerant, possible leak in air-to-refrigerant side of heat exchanger	Repair or replace heat exchanger and recharge according to specifications
	Refrigeration compressor is overheated	Turn off dryer and wait 20-40 minutes, restart dryer. Refrigerant control settings may need adjustment, contact Technical Support
	Refrigeration compressor has burned out or windings have gone to ground	Replace compressor; check for leak in refrigeration circuit, repair and recharge according to specifications. Contact Technical Support.

6.6 APET Series Troubleshooting Guide

Problem	Probable Cause	Remedy
Water downstream and dryer system not working properly or not working (cont.)	Refrigeration compressor cycles on/off and cannot maintain suction pressure, dryer undersized	Check airflow (cfm) and dryer capacity. Reduce airflow through dryer or replace with a larger rated cfm dryer
	Shorted fan motor winding	Check fan motor with ohmmeter and refer to motor specifications for correct value. Check wiring schematic to ensure proper wiring of fan motor. Replace motor if required.
	Fan motor overload or unit short cycling	Check circuitry against electrical schematic (wiring diagram). Check for high refrigerant pressure or for high ambient temperature.
	Defective overload protectors (fuses or breakers)	Check overload protectors and replace if necessary
	Low voltage or 3-phase imbalance	Check incoming power supply, voltage must be within 8% to 12% of rating on the serial plate label.
	Low water flow or pressure to water-cooled condenser	Check water flow and/or pressure and adjust according to specifications. Contact Technical Support for assistance.
	Defective fan control cycling switch	Replace fan control cycling switch
Low air pressure downstream or high pressure drop across the dryer system	Optional pre-filter element dirty or plugged	Replace filter element
	Suction pressure below set point, causing freezing in the dryer heat exchanger*	Refrigeration controls may require adjustment; contact Technical Support for assistance. Refrigeration circuit may be low on refrigerant. Locate leak in refrigeration circuit, repair, and recharge according to specifications.
	Incorrect sizing or restriction in compressed air line piping	Check compressed air piping for restrictions. Check piping size to verify if it has the capacity to handle the rated scfm at present working pressure of compressed air system.

*NOTICE: To confirm freeze-ups, shut system off for 20 minutes and allow to thaw. Air pressure in line should come back to normal pressure.

6.6 APET Series Troubleshooting Guide

Problem	Probable Cause	Remedy
Low air pressure downstream due to continuous air flow through the moisture drain line	Failed or short circuited timer on drain	Replace timer drain
	Failed drain solenoid	Replace timer drain
	Solenoid valve stuck open	If power is off and the air stops leaking, replace the timer drain. If power is off and air continues leaking, clean the timer drain.
Noise or vibration coming from refrigeration air dryer system	Shipping damage has caused compressor mounting to loosen	Check all mounting bolts on compressor and tighten
	Cabinet panels or support beams loosened during shipping	Check all screws and bolts on dryer system and tighten
	Loose mounting bolts, bent fan blade, or worn bearings on condenser fan motor	Tighten bolts, straighten or replace fan blade, or replace fan motor
	Noise coming from refrigeration compressor due to liquid refrigerant in compressor - caused by shipping or moving of dryer	Let dryer system sit for six hours to allow refrigerant to settle out of compressor and to allow crankcase heater to warm compressor
Timer drain stuck open	Failed or dirty timer drain	If power is off and the air stops leaking, replace the timer drain. If power is off and air continues leaking, clean the timer drain.

6.6 APET Series Troubleshooting Guide

Problem	Probable Cause	Remedy
High refrigeration circuit head pressure (compressor is overloaded and gauge is reading out of recommended pressure range)	Refrigeration condenser coil fouled or dirty or air flow blocked	Clean/blow off condensing coil of dirt or debris from the inside out. Clear area in front of condensing coil of any items blocking airflow to coil.
	Condenser fan motor not working properly	Check fan motor for proper voltage and amp draw, repair or replace fan motor
	Defective fan control switch	Repair switch or replace
	Ambient temperature too high at refrigeration dryer location	Cool ambient temperature around location of refrigeration dryer down to a maximum of 100°F or relocate dryer to a different area with lower ambient temperature
	Compressed air temperature entering the refrigeration dryer is too high	Check compressed air inlet temperature to ensure it is within the operating parameters listen in the Design Parameters section. Check air compressor aftercooler for proper operation.
	Faulty heat exchanger, compressed air leaking into refrigeration circuit	Repair or replace evaporator or heat exchanger and recharge with refrigerant
Low refrigeration circuit head pressure (gauge is reading out of recommended pressure range)	Ambient temperature too low at refrigeration dryer location	Increase ambient temperature at refrigeration dryer location or relocate dryer. Head pressure control valve may be required for low ambient use. Contact technical support for assistance.
	Refrigeration dryer circuit low on refrigerant	Refrigeration circuit low on refrigerant; locate leak in refrigeration circuit, repair, and recharge according to specifications.
	Refrigeration compressor not working properly or faulty	Check refrigeration compressor for proper voltage and amp draw; repair or replace refrigeration compressor.
	Compressed air temperature to refrigeration dryer too low	The inlet compressed air temperature must be higher than 40°F. If compressed air temperature is lower than 40°F, turn refrigerated air dryer off. Air may pass through the dryer under this condition, once the compressed air temperature has increased to 44°F, the dryer must be turned back on to avoid a high refrigerant pressure situation.

6.6 APET Series Troubleshooting Guide

Problem	Probable Cause	Remedy
High refrigerant suction pressure, suction gauge reading out of range, and water downstream of refrigeration dryer	Refrigeration circuit hot gas bypass valve out of adjustment or defective	Contact Technical Support for assistance
	Refrigeration expansion valve or TXV adjustment fitting out of adjustment	Contact Technical Support for assistance
Low refrigerant suction pressure, suction gauge reading out of range, and/or refrigeration compressor covered with ice	Refrigeration circuit hot gas bypass valve out of adjustment or defective	Contact Technical Support for assistance
	Refrigeration expansion valve or TXV adjustment fitting out of adjustment and is not feeding enough refrigerant to evaporator	Contact Technical Support for assistance
	Excessive pressure drop on the high side of the refrigeration circuit	Check for a plugged in-line filter dryer or receiver on the refrigeration circuit that could be causing these restrictions.
Compressor oil downstream of refrigerated air dryer	Check optional pre-filter condensate drain for failure	Dismantle pre-filter drain and clean or replace
	Failed or plugged filter element	Check optional pre-filter and replace element
	Air compressor injecting excessive oil into the air stream	Check air compressor for oil leak into the air stream, check air oil separator element for failure

APPENDIX A: SPECIFICATIONS

A.1 Tables of specifications - APET Series

For dimensions, weights, and connection sizes, see the drawing of the dryer model provided at purchase.

Type of dryer: Refrigerated

Power supply: 115, 230, 460 Volt / single or three phase / 60Hz

Refrigerant type: R-134A

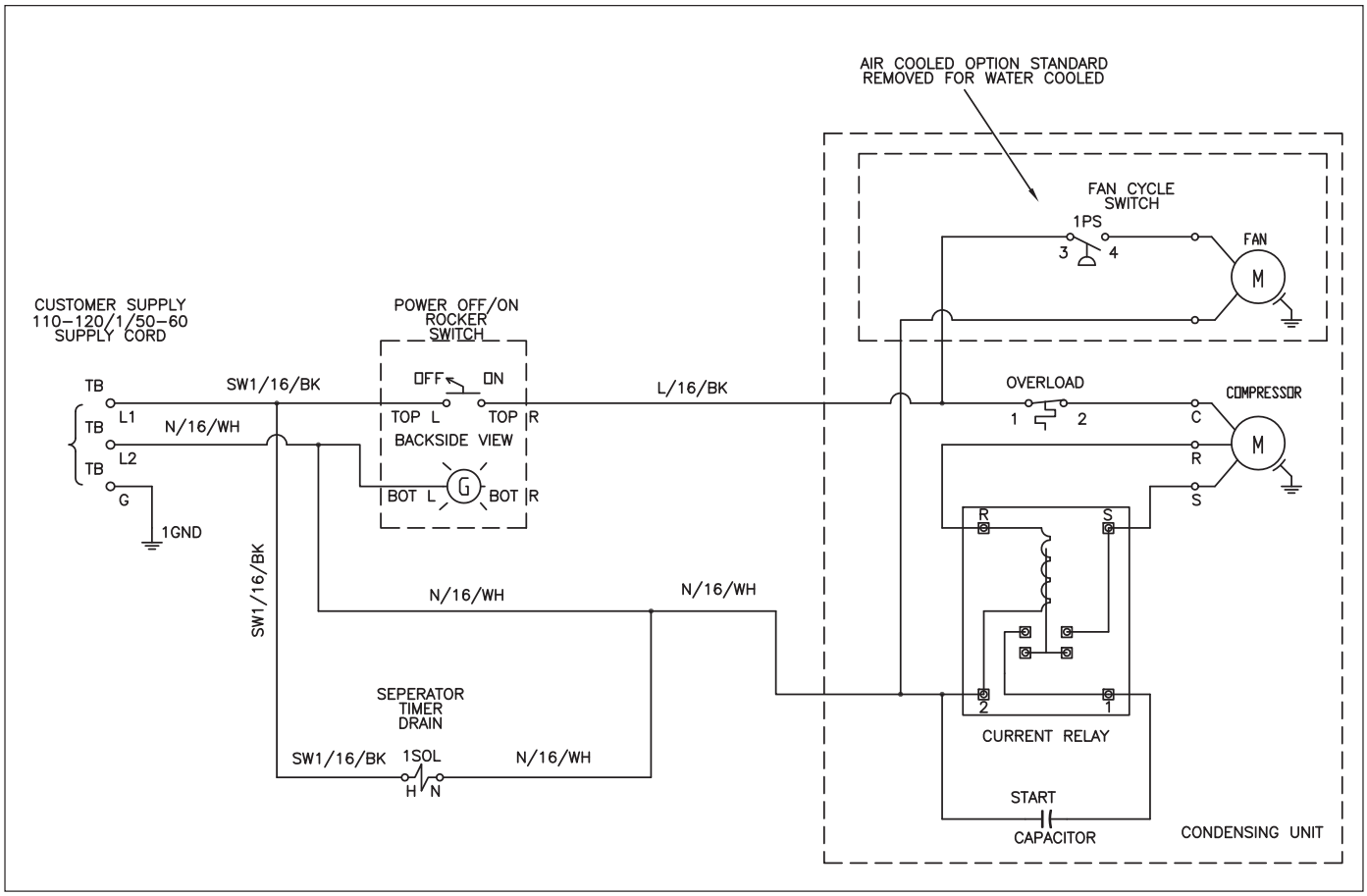
Chemical Composition: HFC

	All Models				R-134a	
Parameter Description	Air Pressure	Air Inlet Temperature	Ambient Temperature	Evaporator Temperature	Suction Gauge Reading	Discharge Gauge Reading
Optimum	100 - 125 psig	80 - 100 (°F)	75 (°F)	35 - 42 (°F)	28 - 40 psig	160 - 230 psig
Maximum	See data label	140 (°F)	120 (°F)	60 (°F)	60 psig	260 psig
Minimum	225 psig	40 (°F)	35 (°F)	33 (°F)	28 psig	80 psig

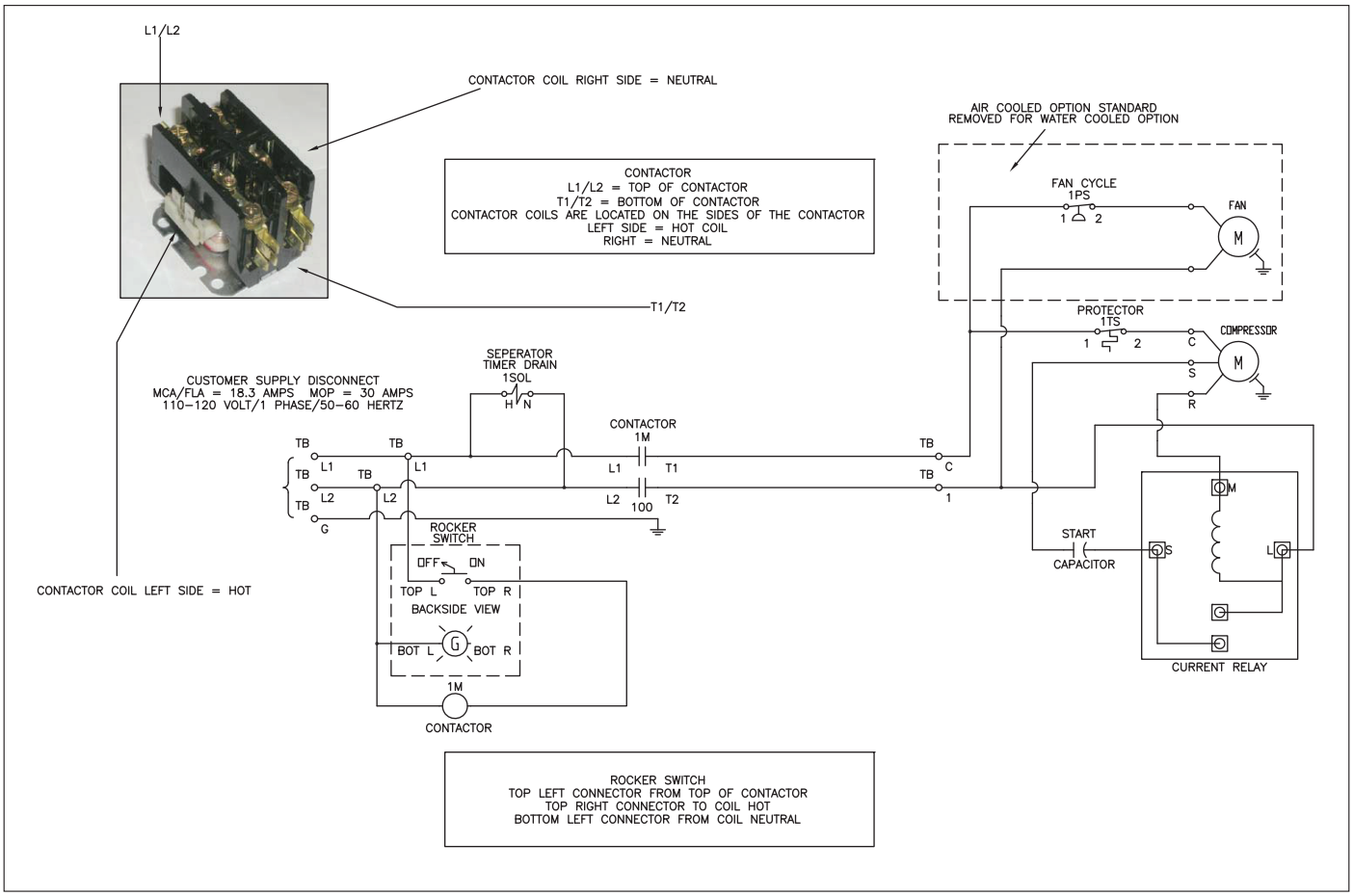
APPENDIX B: WIRING DIAGRAMS

B.1 APET Series

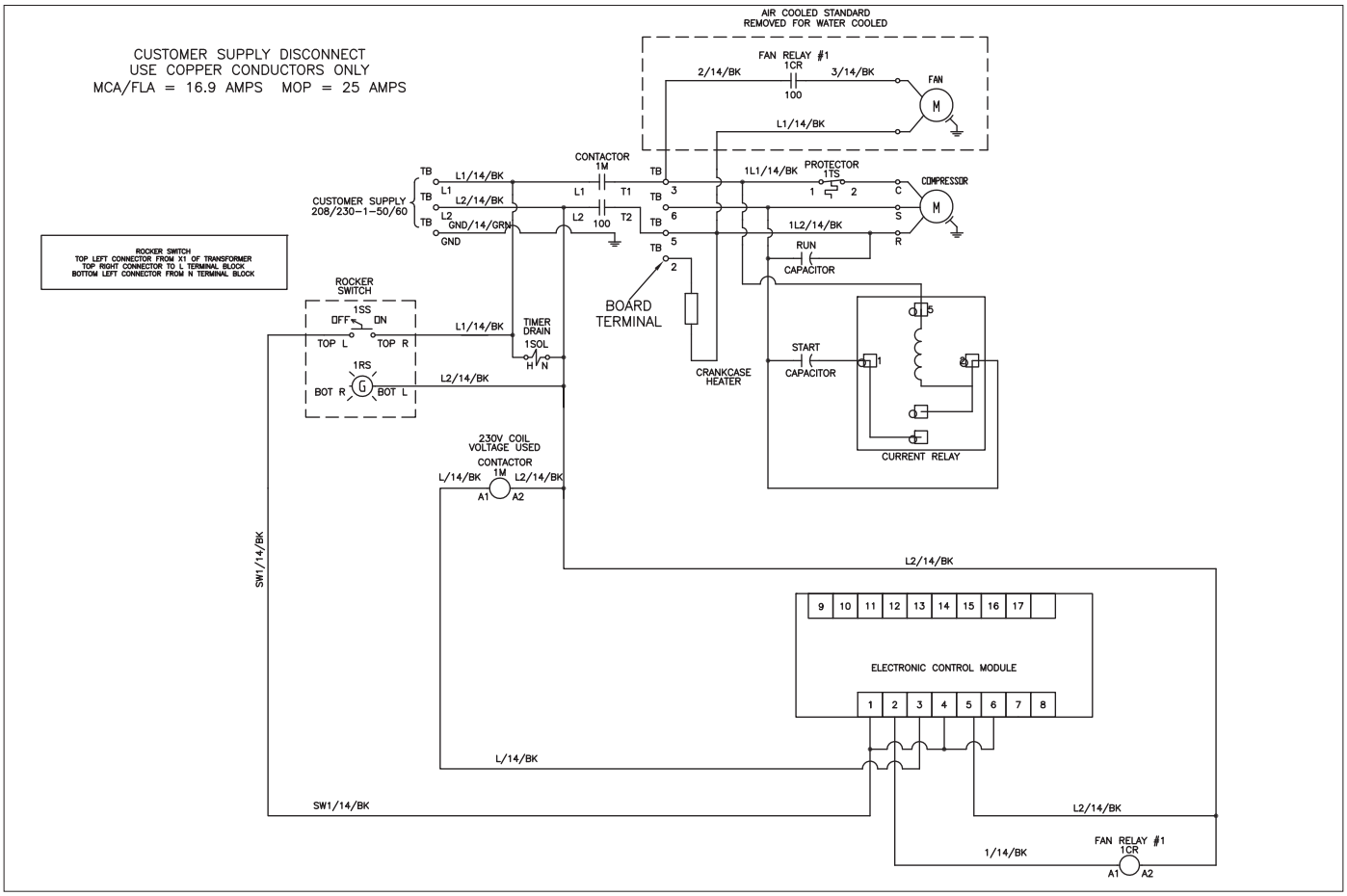
45 - 80 scfm



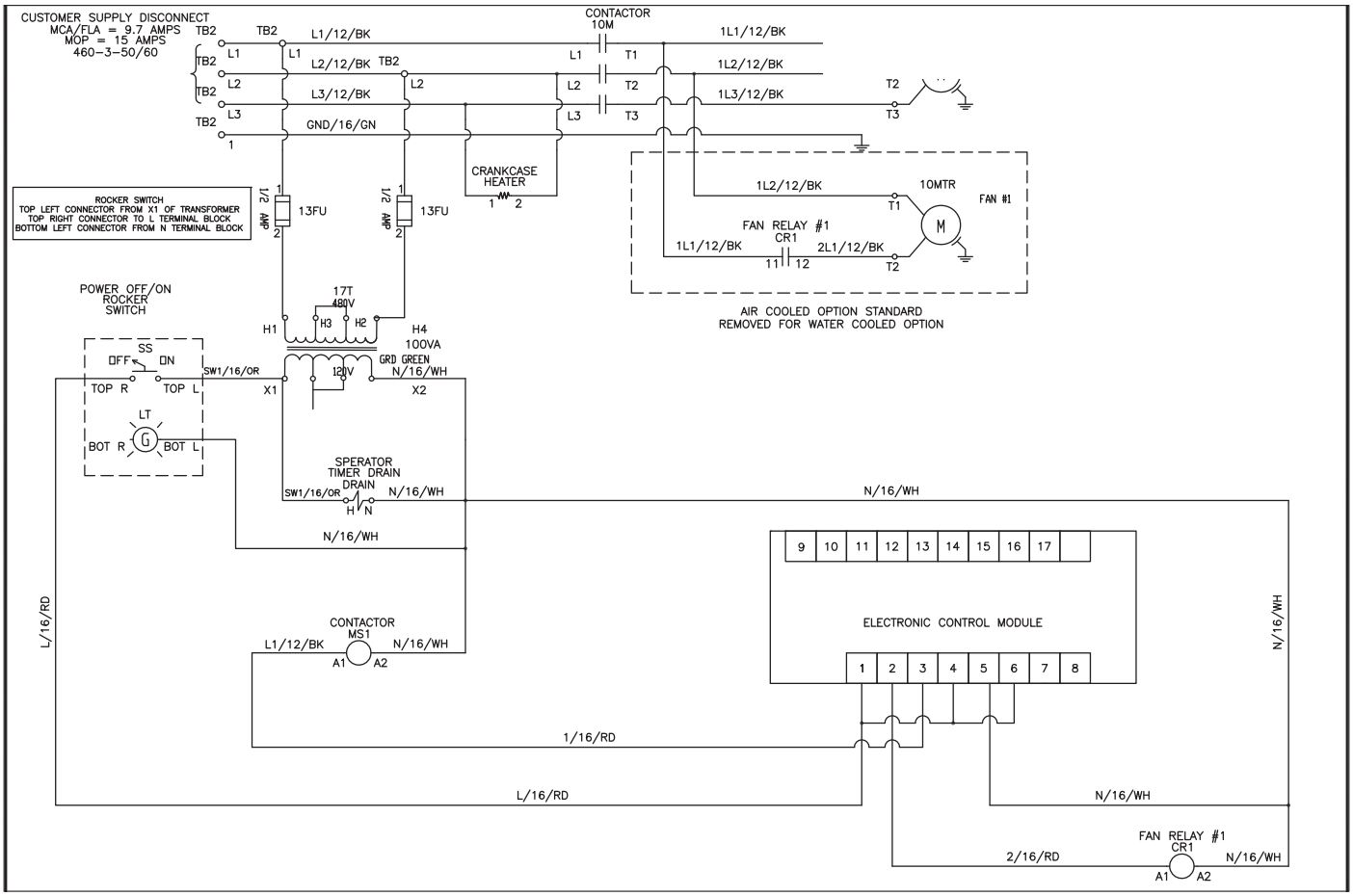
B.1 APET Series
125 - 200 scfm



B.1 APET Series
260 scfm

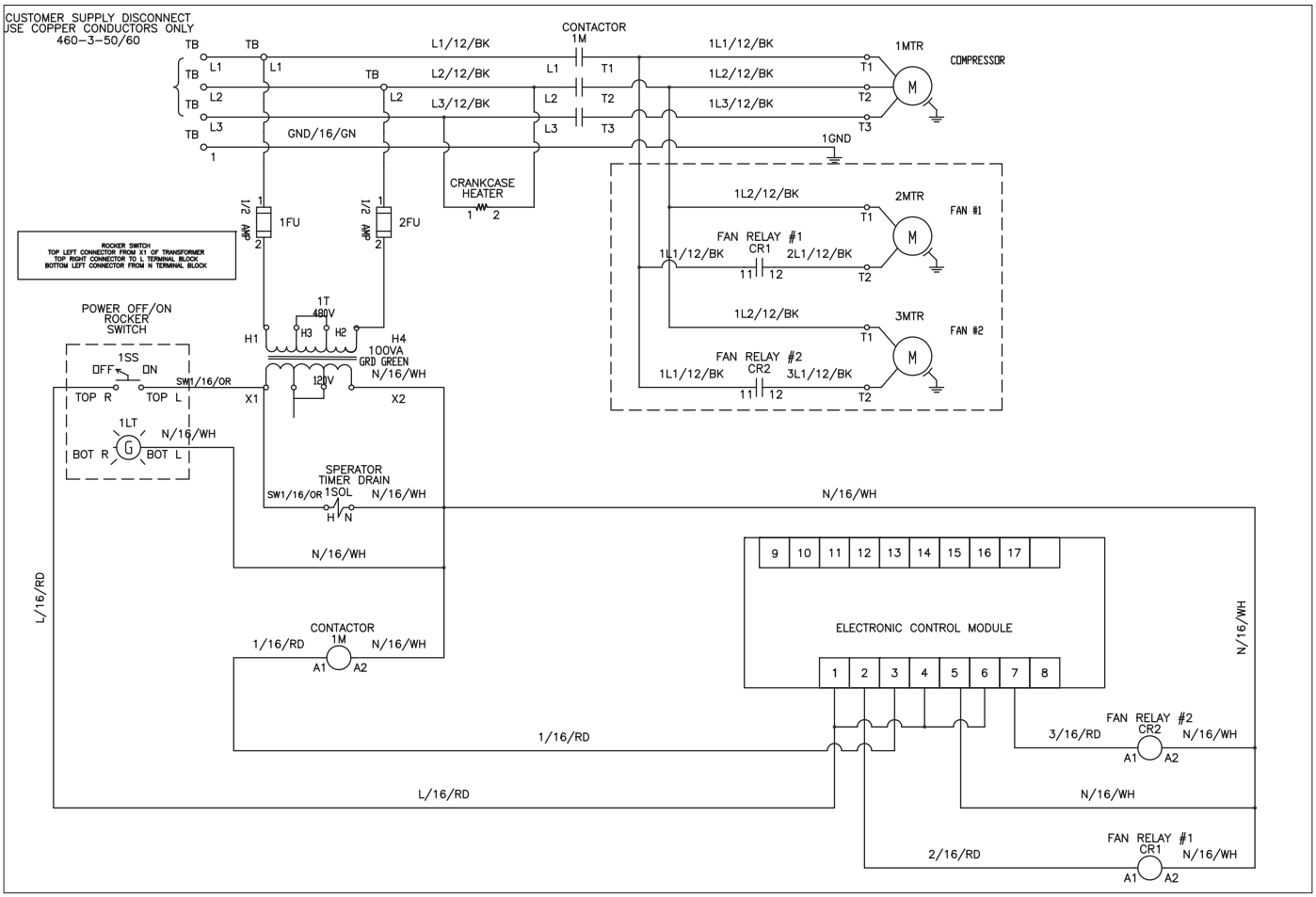


B.1 APET Series
415 scfm



B.1 APET Series

570 - 1,000 scfm



APPENDIX C: MATERIAL SAFETY DATA SHEETS

C.1 R-134a Refrigerant

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SAFETY DATA SHEET R-134a

1. IDENTIFICATION

PRODUCT NAME:	Refrigerant 134a
SYNONYMS:	R-134a, REFRIGERANT 134a, HFC 134a,
RECOMMENDED USE:	Refrigerant
DISTRIBUTOR:	Hudson Technologies Company
ADDRESS:	PO Box 1541 One Blue Hill Plaza Pearl River, NY 10965
EMERGENCY PHONE:	1- 800-501-4376
CHEMTREC PHONE:	1-800-424-9300
INFORMATION PHONE:	1-800-953-2244

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Colorless, volatile liquid with ethereal and faint sweetish odor. Non-flammable material. Contact with the liquid may cause frostbite. Overexposure to vapors by inhalation may cause dizziness and loss of concentration. At higher levels, central nervous system depression and cardiac arrhythmia may result from exposure. Vapors displace air and can cause asphyxiation in confined spaces. At higher temperatures, (>250°C), decomposition products may include Hydrochloric Acid (HCL), Hydrofluoric Acid (HF) and carbonyl halides.

HAZARD CLASSIFICATION: Gases Under Pressure
USDOT Hazard Class 2.2, Non-Flammable Gas

SIGNAL WORD: **WARNING**

HAZARD STATEMENTS: Gas under pressure; may explode if heated
Harmful in contact with skin - may cause frostbite
May displace oxygen and cause rapid suffocation. Inhalation of high concentrations of vapor is harmful and may cause heart irregularities, unconsciousness, or death.

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PRECAUTIONARY STATEMENTS

PREVENTION: Do not breathe vapors. Use only with adequate ventilation - never in a closed space. Wear protective gloves. Wear eye protection.

RESPONSE: If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a physician. If not breathing, give artificial respiration, preferably mouth to mouth.
If breathing is difficult, give oxygen. Avoid stimulants. Do not give adrenalin
If on skin: Wash with plenty of water (not hot water) or use other means to warm skin slowly.
If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a physician.

STORAGE: Protect from sunlight. Store in well-ventilated place.
Do not heat above 120°F (50°C). Do not store in damp areas.

DISPOSAL: Comply with Federal, State and local regulations. Reclaim by distillation or remove to a permitted waste disposal facility

CARCINOGENICITY: Ingredients found on one of the OSHA designated carcinogen lists are listed below.

INGREDIENT NAME	NTP STATUS	IARC STATUS	OSHA LIST
No ingredients listed in this section			

3. COMPOSITION / INFORMATION ON INGREDIENTS

PRODUCT NAME: Refrigerant 134a

SYNONYMS: R-134a, REFRIGERANT 134a, HFC 134a

INGREDIENT NAME CAS NUMBER WEIGHT %

Ingredient Name	CAS Number
1,1,1,2-Tetrafluoroethane (HFC-134a)	811-97-2

Trace impurities and additional material names not listed above may also appear in Section 15 toward the end of this Safety Data Sheet.

4. FIRST AID MEASURES

SKIN: Promptly flush skin with water until all chemical is removed. If there is evidence of frostbite, bathe (do not rub) with lukewarm (not hot) water. If water is not available, cover with a clean, soft cloth or similar covering. Get medical attention if symptoms persist.

EYES: Immediately flush eyes with large amounts of water for at least 15 minutes (in case of frostbite water should be lukewarm, not hot) lifting eyelids occasionally to facilitate irrigation. Get medical attention if symptoms persist.

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INHALATION: Immediately remove to fresh air. If breathing has stopped, give artificial respiration. Use oxygen as required, provided a qualified operator is available. Get medical attention. Do not give epinephrine (adrenaline).

INGESTION: Ingestion is unlikely because of the physical properties and is not expected to be hazardous. In case of accidental ingestion, get medical attention. Do not induce vomiting unless instructed to do so by a physician.

ADVICE TO PHYSICIAN: Because of the possible disturbances of cardiac rhythm, catecholamine drugs, such as epinephrine, should be used with special caution and only in situations of emergency life support. Treatment of overexposure should be directed at the control of symptoms and the clinical conditions.

5. FIRE FIGHTING MEASURES

FLAMMABLE LIMITS IN AIR, (% BY VOLUME) UPPER: N/A LOWER: N/A

FLASH POINT: None

AUTOIGNITION TEMPERATURE: F: >1369; C: >743

NFPA HAZARD CLASSIFICATION
HEALTH: 1 FLAMMABILITY: 0 REACTIVITY: 1 OTHER:

EXTINGUISHING MEDIA: Appropriate for combustibles in the area.

SPECIAL FIRE FIGHTING PROCEDURES: Use water spray to cool containers. Self-contained breathing apparatus (SCBA) is required if cylinders rupture and contents are released under fire conditions.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Cylinders may rupture under fire conditions. HFC 134a should not be permitted to mix with air above atmospheric pressure or at high temperatures, or in an oxygen enriched environment, since under such conditions it can become combustible in the presence of an ignition source.

HAZARDOUS DECOMPOSITION PRODUCTS: Under high temperatures, this product can form hydrofluoric acid, and possibly carbonyl fluoride.

6. ACCIDENTAL RELEASE MEASURES

IN CASE OF SPILL OR OTHER RELEASE:
(Always wear recommended personal protective equipment.)
Evacuate unprotected personnel. Protected personnel should remove ignition sources and shut off leak, if without risk, and provide ventilation. Use self-contained breathing apparatus (SCBA) for large spills or releases. Unprotected personnel should not return until air has been tested and determined safe, including low- lying areas.

Spills and releases may have to be reported to Federal and/or local authorities. See Section 15 regarding reporting requirements.

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7. HANDLING AND STORAGE

NORMAL HANDLING: Always wear recommended personal protective equipment.
Avoid breathing vapors and liquid contact with eyes, skin or clothing. Do not puncture or drop cylinders, expose them to open flame or excessive heat. Use authorized cylinders only. Follow standard safety precautions for handling and use of compressed gas cylinders. R-134A should not be mixed with air above atmospheric pressure for leak testing or any other purpose.

STORAGE RECOMMENDATIONS:
Store in a cool, well-ventilated area of low fire risk and keep out of direct sunlight. Protect cylinder and its fittings from physical damage. Storage in subsurface locations should be avoided. Close valve tightly after use and when empty. Cylinder temperatures should not exceed 52° C (125° F).

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS: Provide local ventilation at filling zones and areas where leakage is probable. Mechanical (general) ventilation may be adequate for other operating and storage areas.

PERSONAL PROTECTIVE EQUIPMENT

SKIN PROTECTION: Skin contact with refrigerant may cause frostbite. General work clothing and gloves (leather) should provide adequate protection. If prolonged contact with the liquid or gas is anticipated, insulated gloves constructed of PVA, neoprene or butyl rubber should be used. Any contaminated clothing should be promptly removed and washed before reuse.

EYE PROTECTION: For normal conditions, wear safety glasses. Where there is reasonable probability of liquid contact, wear chemical safety goggles.

RESPIRATORY PROTECTION: None generally required for adequately ventilated work situations. For accidental release or non-ventilated situations, or release into confined space, where the concentration may be above the PEL of 1,000 ppm, use a self-contained, NIOSH- approved breathing apparatus or supplied air respirator. For escape: use the former or a NIOSH-approved gas mask with organic vapor canister.

ADDITIONAL RECOMMENDATIONS: Where contact with liquid is likely, such as in a spill or leak, impervious boots and clothing should be worn. High dose-level warning signs are recommended for areas of principle exposure. Provide eyewash stations and quick-drench shower facilities at convenient locations. For tank cleaning operations, see OSHA regulations, 29 CFR 1910.132 and 29 CFR 1910.133.

EXPOSURE GUIDELINES

INGREDIENT NAME	ACGIH TLV	OSHA PEL	OTHER LIMIT
1,1,1,2-Tetrafluoroethane	None	None	*1000 ppm TWA (8hr)

* = Workplace Environmental Exposure Level (AIHA)

OTHER EXPOSURE LIMITS FOR POTENTIAL DECOMPOSITION PRODUCTS:

Hydrogen Fluoride: ACGIH TLV: 3 ppm ceiling

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C.1 R-134a Refrigerant

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9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE:	Clear, colorless liquified gas
ODOR:	Slight ethereal
PHYSICAL STATE:	liquified gas
BOILING POINT (@ 736 mm Hg):	F: -15.7
	C: -26.5
VAPOR PRESSURE (psia):	96 @ 77F (25C)
VAPOR DENSITY (AIR = 1):	3.6 @ 77F (25C)
SPECIFIC GRAVITY (H2O = 1):	1.208 @ 77F (25C)
EVAPORATION RATE (CCL4 =1):	>1
SOLUBILITY IN WATER (@14.7 psia):	0.15 WT% @ 77F (25C)
PERCENT SOLIDS BY WEIGHT:	Gas
PERCENT VOLATILE:	100% By Wt
VOLATILE ORGANIC COMPOUNDS (VOC):	Gas

10. STABILITY AND REACTIVITY

NORMALLY STABLE (CONDITIONS TO AVOID):
The product is stable.
Do not mix with oxygen or air above atmospheric pressure. Any source of high temperature, such as lighted cigarettes, flames, hot spots or welding may yield toxic and/or corrosive decomposition products.

INCOMPATIBILITIES:
Under specific conditions: e.g. very high temperatures and/or appropriate pressures – Freshly abraded aluminum surfaces may cause strong exothermic reaction. Chemically active metals: potassium, calcium, powdered aluminum, magnesium and zinc.

HAZARDOUS DECOMPOSITION PRODUCTS:
Halogens, halogen acids and possibly carbonyl halides. These materials are toxic and irritating.

HAZARDOUS POLYMERIZATION:
Will not occur.

11. TOXICOLOGICAL INFORMATION

IMMEDIATE (ACUTE) EFFECTS:
LC_{50} : 4 hr. (rat) - > 500,000 ppm / Cardiac Sensitization threshold (dog) > 80,000 ppm

DELAYED (SUBCHRONIC AND CHRONIC) EFFECTS:
Teratogenic NOEL(rate and rabbit) – 40,000 ppm
Subchronic inhalation NOEL (rat) - 50,000 ppm / Chronic NOEL – 10,000 ppm

OTHER DATA:
Not active in four genetic studies
Toxicity to reproduction: Did not show mutagenic or teratogenic effects in animal experiments

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C.1 R-134a Refrigerant

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12. ECOLOGICAL INFORMATION

Aquatic Toxicity:
48-hour EC50, Daphnia magna: 980 mg/L
96-hour LC50. Rainbow trout: >450mg/L

Degradability (BOD): R-134A is a gas at room temperature; therefore, it is unlikely to remain in water.
Octanol Water Partition Coefficient: Unknown for mixture

13. DISPOSAL CONSIDERATIONS

RCRA - Not a hazardous waste.

OTHER DISPOSAL CONSIDERATIONS:
Disposal must comply with federal, state, and local disposal or discharge laws. R-134A is subject to U.S. Environmental Protection Agency Clean Air Act Regulations Section 608 in 40 CFR Part 82 regarding refrigerant recycling.

The information offered here is for the product as shipped. Use and/or alterations to the product such as mixing with other materials may significantly change the characteristics of the material and alter the RCRA classification and the proper disposal method.

14. TRANSPORT INFORMATION

HAZARD CLASS:	2.2
ID NUMBER:	UN3159
PACKING GROUP:	N/A
LABEL STATEMENT:	NONFLAMMABLE GAS
SHIPPING CONTAINERS:	Tank Cars, cylinders, ton tanks

For additional information on shipping regulations affecting this material, contact the information number found in Section 1.

15. REGULATORY INFORMATION

TOXIC SUBSTANCES CONTROL ACT (TSCA)
TSCA INVENTORY STATUS: Components listed on the TSCA inventory
OTHER TSCA ISSUES: None

SARA TITLE III / CERCLA
"Reportable Quantities" (RQs) and/or "Threshold Planning Quantities" (TPQs) exist for the following ingredients.

INGREDIENT NAME	SARA / CERCLA RQ (lb.)	SARA EHS TPQ (lb.)
No ingredients listed in this section		

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Spills or releases resulting in the loss of any ingredient at or above its RQ requires immediate notification to the National Response Center [(800) 424-8802] and to your Local Emergency Planning Committee.

SECTION 311 HAZARD CLASS: IMMEDIATE PRESSURE

SARA 313 TOXIC CHEMICALS:
The following ingredients are SARA 313 "Toxic Chemicals". CAS numbers and weight percents are found in Section 3.

INGREDIENT NAME	COMMENT
No ingredients listed in this section	

STATE RIGHT-TO-KNOW
In addition to the ingredients found in Section 3, the following are listed for state right-to-know purposes.

INGREDIENT NAME	WEIGHT %	COMMENT
No ingredients listed in this section		

ADDITIONAL REGULATORY INFORMATION:
R-134A is subject to U.S. Environmental Protection Agency Clean Air Act Regulations at 40 CFR Part 82.

WARNING:
Do not vent to the atmosphere. To comply with provisions of the U.S. Clean Air Act, any residual must be recovered.

1,1,1,2-Tetrafluoroethane (HFC-134a), is a greenhouse gas which may contribute to global warming.

16. OTHER INFORMATION

DISCLAIMER: The above information is based upon technical information believed to be accurate but does not purport to all-inclusive and should be used only as a guide. Hudson Technologies Company shall not be held liable for any damage from handling or from contact with this product. No warranty of merchantability or any warranty, express or implied is made with respect to such information

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NOTES

DATE	SERVICE PERFORMED	NOTES

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DATE	SERVICE PERFORMED	NOTES

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DATE	SERVICE PERFORMED	NOTES

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DATE	SERVICE PERFORMED	NOTES

WARRANTY INFORMATION

Aircel warrants that its Standard Refrigerated Air Dryers are free from defects in materials and workmanship for two years from the date of invoice. Warranty coverage for this time period will be parts and labor for the first year and parts only for the second. Custom engineered products, desiccant dryers, chillers and nitrogen generators are warranted to be free from defects in materials and workmanship for one year from date of invoice. Warranty coverage for this time period will be for parts and labor.

Aircel warranty excludes damages due to corrosion, lack of proper maintenance, incorrect installation, modification, or misapplication of equipment. Routine maintenance or adjustment required under normal operation as outlined in the Aircel operation and maintenance manuals are not covered under warranty.

Once Aircel has been given adequate opportunity to remedy any defects in material or workmanship in accordance with Aircel Warranty Policy and Procedures, Aircel retains the sole option to accept return of the goods, with freight paid by the purchaser, and to refund the purchase price for the goods after confirming the goods are returned undamaged and in usable condition. Such a refund will be the full extent of Aircel liability. Aircel shall not be liable for any other costs, expenses or damages whether direct, indirect, special, incidental, consequential or otherwise. The terms of this warranty may be modified only by a special warranty document signed by a CEO, General Manager or Vice President of Aircel.

There exist no other representations, warranties or guarantees except as stated in this paragraph and all other warranties, including merchantability and fitness for a particular purpose whether express or implied, are hereby expressly excluded and disclaimed.

Parts & Service

For genuine Aircel replacement parts, call

800.767.4599

For faster service, please have your unit model and serial number, part number, or description.